Stabilization Policy and Business Cycle Phases in Europe : A Markov Switching VAR Analysis

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Abstract

Most of the empirical studies dealing with international business cycles have disregarded the credibility issues that play an important role in the decision to join or not a monetary union. Most of empirical applications based on asymmetric shocks have failed to account for these aspects. In this paper, we tackle this problem by relying on a regime switching approach that characterizes the position of each economy in its business cycle. Then, using desynchronisation indices based on a non parametric approach, we measure the amplitude and the duration of divergence in the business cycles in order to assess the potential stabilization cost induced by the European economic and monetary union.

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1 Introduction

The analysis of international business cycles is still attracting the interest of the economic profession (see for instance Canova and Marinan 1998, Ballabriga et al. 1998 or Kwark 1999). A deep understanding of the sources and propagation of the cycles is crucial to the management of international economic relations. Previous studies focus on the synchronization of the cycles across countries. However, such an approach is not very useful from an economic policy point of view. Governments seem reluctant to use economic policy instruments to respond to every divergence of their cycles. Only large and persistent divergence may induce some reaction. It is therefore more fruitful to focus on cycles' phases. This approach is adopted here to analyze European business cycles.

The third and ¯nal stage of the Economic and Monetary Union (EMU) in Europe started on the ¯rst of January 1999. The Euro became the single and o±cial currency of the eleven participating countries. At the same time monetary policy setting was transferred to a single authority : the European Central Bank. As a consequence national policy makers are deprived from a stabilisation instrument, i.e. monetary policy. They, however, will continue to exert a great deal of in°uence over ¯scal policy despite the fact that governments are intended to respect the provisions of the stability and growth pact. Such provisions aim at insuring the stability of the Euro and sound growth conditions for the European economy.

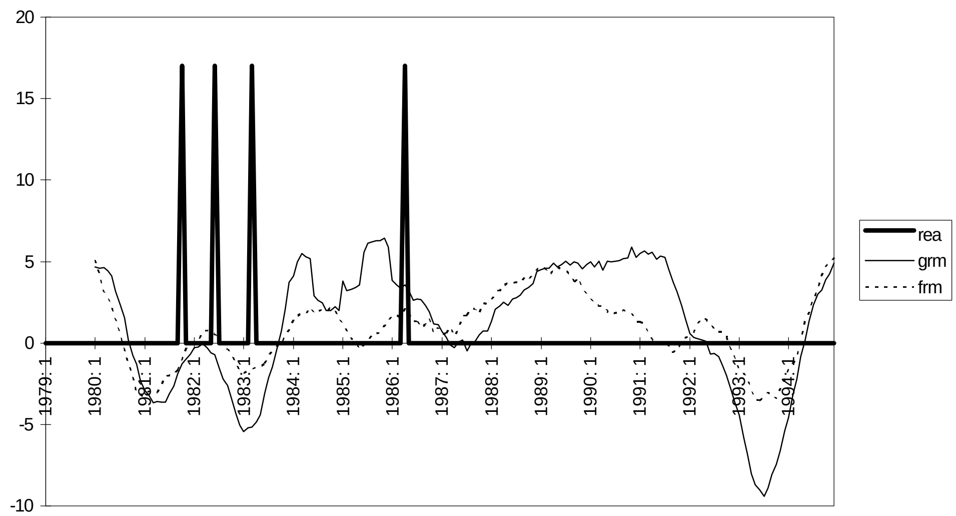
National autonomy over ¯scal policy is targeted toward responses to national speci¯c shocks. The stability and growth pact implies budgetary discipline but also acknowledges the need for governments to react to asymmetric shocks. In particular, the pact pointed out to severe recessions as problematic periods during which budgetary °exibility could be allowed. Country speci¯c recessions are clearly situations where greater budgetary °exibility is needed.[1]

This paper sheds some light on the need for individual European countries to use alternative stabilisation instruments including budgetary policy to respond to future speci¯c recessions. To this end, we examine the experience of European countries with speci¯c recessions over the past three decades. Hence, we focus on the comparison of the phases of countries' cycles. We seek to determine to which extent European countries experienced divergent phases (recessions/expansions) of their cycles in the past. Our analysis is therefore di®erent from the previous literature concerned with optimum currency areas (OCA) or international business cycles, which seeks to identify the degree of asymmetry of shocks. In order to identify the (de)synchronisation of the cycles, this literature uses more or less sophisticated correlation technics, but however fails to investigate whether countries experience in general similar or di®erent phases of the cycle. From the stability and growth pact perspective, the relevant concepts are recessions and expansions, i.e. the phases of the cycles.

Focusing on recessions and expansions instead of raw cycles correlations is also relevant with respect to the traditional assessment of the actual cost of losing the nominal intra-European exchange rates as a stabilisation instrument. The European experience suggests that governments are not willing to use

[1] For an extended analysis of ¯scal policies in relation with the stability and growth pact, see Buti and Sapir (1998). Fiscal policies as stabilisation tools at the European level could be also implemented through a ¯scal federalism system of transfers like the one prevailing in numerous federal states (United States, Germany and Canada among others) (see on this point for instance Sachs and Sala-I-Martin 1991). In this case too, country speci¯c recessions are primarily situations that are considered.

unilateral discretionary policies to react to all divergences of their cycles. Reputation and cooperation considerations may explain such a behavior. Besides, this is one of the main criticisms emphasized by De Grauwe (1996) of the traditional OCA theory. For instance, during the eighties, some European countries did not use the exchange rate instrument to respond to some divergences of their cycles with respect to the German one. They might have preferred to enhance their reputation as a credible ERM participant even at the expense of some internal economic di±culties. As a result, allowing for exchange rate adjustments has been used only in extreme situations, for instance where the involved country faced a speci¯c (and lasting) recession.



Figures 1 : French and German Business Cycle and exchange rate alignment

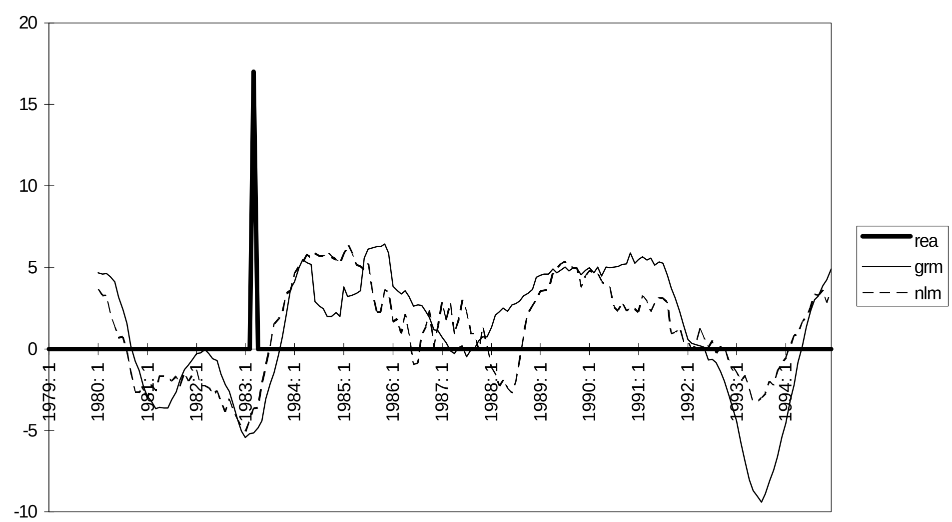


Figure 2 : Dutch and German Business Cycles and exchange rate realignment

To illustrate the point, let us consider the case of France and the Netherlands. We combine information concerning the evolution of industrial production since 1979 and the dates of realignments with respect to the Deutsche mark (DM). Figures 1 and 2 present a seven months centered moving average of the rates of growth of industrial production. The growth rates are computed as percentage change of a given month production with respect to the corresponding month of the previous year. Each figure compares the German situation (denoted grm) with that of a given country. Industrial production series are drawn from OECD tapes. The dates of realignment with respect to the DM (noted rea) are indicated by bold vertical lines. In France the last realignment occurred in 1986. It followed a period of divergent business cycle between France and Germany. Between 1989 and 1992 the French industrial production growth rate (frm) slowed down significantly in comparison with the German one. Despite this divergent evolution of business cycles and its persistence, realignments of the French franc have not taken place. For the Netherlands which had engaged in a pegging strategy of the Guilder to the Mark since the early eighties, credibility can be considered as a still more important aspect given its small size and high openness. The Dutch industrial production growth rate (nlm) was much more volatile than the German one between 1986 and 1988. It was also by far lower in many instances. This evolution could have been considered as temporary and had not led to a realignment. More interesting is the fact that the same phenomenon as in France (although less pronounced) occurred between 1990 and 1992 in the Netherlands. The Dutch industrial production experienced a persistent slow down in its growth rate in comparison with the German one but the Netherlands maintained the exchange rate pegging strategy. The analysis of France and the Netherlands experiences with exchange rate management during the eighties clearly shows that they seek to maintain the evolution of their DM exchange rate within the band of fluctuations despite some divergence between their business cycle and the German one. Such a behavior is more noticeable when we consider the 1987-1992 period during which the credibility of the ERM has become an important and well established objective.

Numerous studies have focused either on the cycle datation procedure (Artis, Kontolemis and Osborn 1995, Hassler et al. 1994, Candelon and Hénin 1996) or on the business synchronization issue among countries (Rubin and Thygessen 1997, Artis and Zhang 1997 and 1999). However, none of them has simultaneously treated these two questions. In the measurement of synchronization, they are thus unable to account for the position of economies in business cycle. Furthermore, such analysis often appear too restrictive, since they rely on only one variable (usually GDP or industrial production) whereas the cycle, as traditionally defined by Burns and Mitchell (1946), should summarize the information contained in an exhaustive set of variables. The business cycle characterization can be thus misleading if both a nominal and a real variable are not included[2].

To fulfill these lacks, we proceed in two steps. In a first stage, we estimate the business cycle for each country with a multivariate Markov Switching model (Hamilton 1994 and Warne 1996) including a real variable (unemployment) and a nominal one (inflation). The estimation of this specific Markov Switching model provides conditional probabilities of being in one particular state which can be interpreted as a phase of the business cycle (recession or expansion). Another obvious advantage of such an approach is that the characterisation of the business cycle does not require any expert judgment, like for instance in the NBER datation procedures. Then, in a second stage, from this business cycle characterization, we

[2]One exception is Ballabriga et al. (1999) who studied output and inflation. The two variables are however treated separately, which may influence the identification of the cycles.

develop several non parametric indicators of synchronisation, capturing the extent as well as the duration of the synchronization period.

With the analysis of business cycle phases' synchronisation, the datation of the cycles for various European countries is thus another contribution of this paper. Indeed, by contrast to the US situation there is no official datation of European cycles. Although different, the purpose of this paper is related to previous research on OCA and international business cycles. In the European context, these researches developed in close connection with the debate concerning EMU. An early study by Cohen and Wyplosz (1989) found that symmetric shocks were much larger and dominated asymmetric shocks in Europe. Bayoumi and Eichengreen (1993) showed that demand shocks are more uniform and less pronounced across the Member States than supply shocks. Karras (1994) also addressed the question of the propagation of demand and supply shocks between France, Germany and the UK. He showed that the supply shocks have been synchronous in the three Member States, and that their business cycles have been highly and positively correlated. Using sectorial data, Helg et al. (1995) found that the highest degree of business cycle synchronisation characterizes Belgium, Germany and the Netherlands. Similar results, although with some specificities, are obtained by Christodoulakis et al. (1995) and Backus et al (1993). Finally, Ballabriga et al. (1999) used a structural Bayesian autoregression approach to study the responses to common and specific shocks in in Germany, France, the UK and Spain. They found that in the short run symmetrical shocks have dominated.

The paper is organized as follows. Section 2 exposes the methodology, i.e. the Markov Switching VAR approach along with the building of (de)synchronisation indicators. Section 3 is devoted to the empirical results. Section 4 concludes.

2 The methodology

In order to characterize the business cycle of each economy, we conduct a bivariate Markov Switching VAR analysis (section 2.1). Then, from the probabilities of being in a particular regime implied by the VAR, we build desynchronisation indexes aiming at assessing to which extent the European countries face synchronized cycles (section 2.2).

2.1 Markov Switching VAR Analysis

Let x_t be a bivariate time series with components $x_t = (\Delta u_t; \Delta p_t)$; where Δu_t and Δp_t are the quarter-to-quarter changes in respectively the unemployment rate and the consumer price level. Since u_t and p_t -which seem to be integrated of order 1 over the whole period under investigation[3]- are not cointegrated, the vector x_t is assumed to be well characterized by the following general Markov Switching VAR(p) model :

$$x_t = \mu_{s_t} + \sum_{k=1}^{p} A^k_{s_t} x_{t-k} + \varepsilon_t, \qquad t = 1, 2, \ldots, T \tag{1}$$

[3]See section 3.1 for more details on the stationarity properties of inflation and unemployment over the investigated period. The results of the test are reported in Appendix 1.

where p denotes the VAR order; $\varepsilon_t \mid s_t \sim N(0; \Omega_{s_t})$ with Ω_{s_t} the covariance matrix being positive definite. The special insight given by the Markov Switching (MS) approach is the use of an unobserved or regime variable s_t which is assumed to follow a q-state Markov process with transition probabilities $\Pr(s_t = j \mid s_{t-1} = i) = p_{ij}$; for all t and $i; j = 1; 2; \ldots; q$; with $\sum_{j=1}^{q} p_{ij} = 1$: The markov process is assumed to be irreducible (no absorbing states) and ergodic.

Throughout the whole analysis, we will assume that $q = 2$, i.e. that two regimes are sufficient to characterize the joint dynamics of changes in unemployment and inflation.[4] Typically, these may be referred to an expansionary and a recessionary regime. Given the short sample, we will constraint $p \leq 4$: In this general specification, the random vector μ_{s_t}, the random matrices $A^k_{s_t}$ and the covariance matrix Ω_{s_t} are allowed to depend on the regime variable s_t: Nevertheless, in order to use a parsimonious framework, we also allow for a restricted model in which Ω_{s_t} is the same across the two regimes, i.e. that the volatility of the joint process is the same during booms and busts. In the constrained case, we will refer to model $m = 2$ while in the general case, we will refer to model $m = 1$.

Maximum likelihood (ML) estimates of model (1) are obtained via the well known Expectation Maximum Likelihood-algorithm (see for more details Hamilton, 1994). The underlying distribution in the ML estimation procedure is assumed to be Gaussian. Our model selection procedure with respect to m and p will be based on the two following sets of statistics. The first one is the well known set of information criteria (Akaike, Schwarz Bayesian Criterion) that are used to select the VAR order p. The second one will refer to misspecification tests that allow to assess the goodness-of-fit properties of the various estimated models. Three specification tests -all based on the conditional scores- are applied both to each equation and to the full system. The first one is an autocorrelation test that examines whether the conditional scores with respect to μ_i at time t are correlated with the conditional scores with respect to μ_j at time $t-1$: The second one is an ARCH-type test that compares the conditional scores at time t with respect to the unique element of Ω_i with the conditional scores at time $t-1$ with respect to the unique element of Ω_j. Finally, we rely on a test investigating the Markov chain assumption along the lines defined by Hamilton (1991). This test compares the conditional scores at time t with respect to p_{ii} with the conditional scores at time $t-1$ with respect to p_{ii} and μ_i:[5] All selected models are required to both satisfy one of the information criteria and to pass the misspecification tests.

Once model (1) estimated, it is possible to recover for all t the implied probability that the economy k is in state 1 ($P_k(s_t = 1)$) that turn out to be the recessionary regime in our analysis. Our subsequent assessment of desynchronization of business cycles is then based on the sequence of these probabilities. Thus, by contrast to NBER methods, our cycle datation is fully data driven. Next section exposes the building of desynchronisation indexes.

[4] Basically, this choice relies on two arguments. From a purely statistical point of view, there does not exist (to the best of our knowledge) any statistical test aiming at assessing the presence of a third regime. As a second best, we have estimated the models with $q = 3$ and notice in most cases only moderate increases in the log-likelihood values (the results are available upon request). From an economic point of view, the interpretation of the third regime turns out to be cumbersome and an asymmetric characterisation (for instance two expansionary regimes and only one recessionary state). In the context of our analysis, one may argue that the difference between two expansionary regimes is irrelevant and does not matter for assessing the magnitude of the stabilization cost.

2

[5] See for more details Hamilton (1991).

2.2 Indicators of Desynchronisation

Indicators of desynchronization help us to assess how coincident are the phases of the business cycle among a set of countries. If two countries share at the same time an expansion or a recession, they can be considered as highly synchronized and so, for instance, constitute an optimal currency area without the need to search for any specific additional stabilisation tool. Therefore, in our MSVAR framework, a straightforward way to gauge the synchronization degree between two countries simply consists in comparing the probabilities of being in a particular regime (recession or expansion). If the difference is low, then countries are synchronized, otherwise they are desynchronized. For each pair of countries k and l, the indicator can be written as follows over the sample $\{1...T\}$:

$$I_1 = 1 - \frac{\sum_{t=1}^{T}[P_k(s_t = 1/I_{t-1}) - P_l(s_t = 1/I_{t-1})]}{T} \tag{2}$$

In (2), we consider 1 minus the difference in order to get a positive relationship between the indicator and the synchronization degree. However, this indicator may appear somewhat restrictive. As exposed in section 2, what matters for assessing the loss of exchange rate as a policy instrument is rather the relative position of each country in the business cycle. Two countries can share the same phase of the business cycle, without necessarily displaying similar conditional probabilities. In this last case, credibility considerations would obviously imply a stability of their bilateral exchange rate.[6] In this view, we propose another indicator that computes the part of the sample during which two countries share the same phase of the cycle. This indicator is based on a binomic variable I_b, which takes the 1 value if the both countries share the same phase of the business cycle (both in expansion, in recession or neither in recession nor in expansion) and the 0 value if they do not share the same phase of the business cycle. To build this indicator it is necessary to characterize business cycle expansion and recession from our bivariate probabilistic model. Following Hamilton (1989), a recession (resp. an expansion) is characterized by a conditional probability of being in state 1 over 0.7 (resp. under 0.3) : $P_k(s_t = 1/I_t) > 0.7$ (resp. $P_k(s_t = 1/I_t) < 0.3$).[7]

Then, the indicator can be expressed as:

$$I_2 = \sum_{t=1}^{T} \frac{I_b}{T} \tag{3}$$

However, this indicator may still appear too restrictive. As exposed in section 2, experiences of several countries suggest that the use of its exchange rate may be called for only when a country faces a relatively isolated recession (or expansion). Therefore, a third indicator is built. The indicative variable I_3 becomes trinomic and takes a value of 0.5, when countries do not share an opposite phase : if $P_k(s_t = 1/I_t) > 0.7$ and $0.3 < P_l(s_t = 1/I_t) < 0.7$ or if $P_k(s_t = 1/I_t) < 0.3$ and $0.3 < P_l(s_t = 1/I_t) < 0.7$.

[6] Another reason is that a lower value of I_1 may simply reflect a slight difference in the estimation of the respective models.

[7] The sensitivity of the results to the choice of these limit values has been performed and does not appear to modify significantly the results.

To complete the analysis, we also need a measure of the duration of the synchronization between a set of countries. Indeed, Cohen and Wyplosz (1989) single out the persistence of divergence as equally important as the extent of divergence when comparing business cycles. Similarly, the need to conduct stabilisation policies for instance through net ¯scal transfers in a ¯scal federalism system similar to the one prevailing in the United States or through discretionary domestic ¯scal policies is rather limited if asymmetric shocks are of a very temporary type (say one quarter). To this aim, an additional indicator (I_4) representing the average length of a synchronization period is also built from the I_2 indicator. [8] A further advantage of the I_4 is that its value has a direct economic interpretation. The higher the indicator, the stronger is the synchronization between the business cycles of the two countries. A low value of I_4 associated with a higher value of the other indicators means that countries often share the same phase of the business cycle, but with frequent and short desynchronization periods. By contrast, a high value of I_4 associated to a low level of the other indicators means that desynchronization and synchronization periods are quite long and not erratic.

3 Empirical results

3.1 Data issues

In our analysis, we consider two variables, the (changes in) unemployment rate and consumer prices measured on a quarterly basis. The use of a quarterly frequency is justi¯ed by the need to observe cycles that are expected to be cushioned by a stabilizing ¯scal policy or by an adjustment of the (e®ective) nominal exchange rate in the spirit of this study. In turn, the use of unemployment rather than GDP as a proxy for economic activity is justi¯ed by the non availability of reliable quarterly data over a su±ciently long period for an important set of countries. Furthermore, by contrast to quarterly GDP, unemployment data are harmonized across countries, which is crucial for comparison purposes.

All data come from the OECD-BSDB database. We consider 11 European countries including EMU participants (Germany, France, Italy, Spain, Finland, Portugal and the Netherlands) but also possible future candidates (Norway, the UK, Switzerland and Sweden). Because of the poor quality of their unemployment data, Belgium and Austria were dropped out of our sample.[9] The investigated period ranges from 1975Q1 to 1996Q4. This choice is made for three main reasons. The ¯rst one is related to the statistical properties of the data. Our MS VAR framework indeed requires the data to be I(0). For some sub-periods including the early 70's, prices have been be found to follow an I(2) process. In order to cope with this problem, along the lines proposed by Juselius (1994), we ignore this sub-period. The second reason lies in the need to consider a period homogeneous with respect to the international monetary agreements. In this respect, it is advised to consider a post-Bretton-Woods period in which the pegging of several exchange rates is exclusively due to European arrangements. Finally, for some countries like Portugal, the unemployment data display a very poor quality before 1975.

[8] This type of indicators have been extensively used in order to measure exchange rate misalignment (see Per¶e and Steinherr (1989)).

[9] A detailed inspection of the data reveals that most quarterly values have been interpolated from annual data. This is of course highly problematic in a business cycle analysis conducted on a quarterly basis. Data problems were also encountered for Denmark, Ireland and Greece.

As mentioned above, a preliminary important point for our MS-VAR analysis in ¯rst di®erence concerns the stationarity of in°ation and of the changes in unemployment over the investigated period. To this aim, Appendix 1 presents the results of the two most popular unit root tests, the Augmented Dickey-Fuller (ADF) test (with three di®erent lag order determination procedures) and the non parametric Phillips-Perron one. This latter may indeed display more power that the ADF tests in small samples and in the presence of breaks. From Appendix 1, it comes out that in general, there is evidence in favour of a stationary in°ation process over the 1975Q1-1996Q4 period. For 7 out of 11 countries, in°ation is clearly found to follow an I(0) process. For two countries (France and Norway), there is some moderate evidence in favour of a non stationary process but these results are not found quite robust.[10] Finally, for Italy and Spain, in°ation is found to follow a I(1) process, which is to some extent meaningful since these countries have undergone a continuous desin°ation process over the investigated period. Nevertheless, it is well known (see for instance Dolado et al. 1993) that these unit root tests display poor power properties in ¯nite samples. Given the number of data points ($T = 88$), the conclusions should be drawn with caution.[11] Second, the stationarity of in°ation is a usual starting point in the empirical analysis conducted over similar periods (see Juselius 1995 or Clarida, Gali and Gertler 1997 on this point). We will thus use the (raw) in°ation data in our VAR analysis.

3.2 Estimation results

For each country, the MS VAR models selected along the lines exposed in section 2.1. are presented in Appendix 2.[12] Nearly all models are found to pass the misspeci¯cation tests at a 5% nominal level. The transition probabilities matrices suggest a quite stable behaviour of our conditional probabilities $P(s_t = 1=I_t)$, which ensures a meaningful decomposition in terms of cycle phases. In Figures (3a) and (3b) (Appendix 3), the estimated smoothed probabilities are plotted for each country.

From the evolution of the recession probabilities, it is possible to distinguish the major business cycles phases in each economy. Although not fully comparable[13], our results reproduce most of the major features emphasized by some of the previous studies. For the sake of illustration, Appendix 4 reminds of the most important turning points for the four major economies identi¯ed by Artis, Kontolemis and Osborn (1995). In the case of Germany, our implied cycle phases are consistent with the peaks in 79M12 and 86M5 as well as the troughs in 82M10 and 86M12. Moreover, the model captures the reuni¯cation shock which has been a®ecting the German economy in 91Q1 and its consequences in terms of in°ationary pressures and unemployment variations. For France, the following turning points are more or less reproduced : for the troughs, 77M10, 82M10, 85M2 and for the peaks 76M12, 79M9, 82M3, 84M2, 92M1 (with some lag). With respect to the UK, the probabilities are in lines with the detected troughs (81M2, 84M8, 92M4) and with the peaks (79M4). In the Italian case, the identi¯ed peaks in 77M1, 80M3, 89M12 and troughs in 77M12 and 83M3 are also well captured. The reproduction of these stylized facts justi¯es the choice of a MS VAR representation to characterize economic °uctuations from which

[10] The test statistics of the ADF(BIC) and the Phillips-Perron tests are indeed rather close to their critical values. Furthermore, restricting the period leads to a change in the conclusions.

[11] Once more, for Italy, the acceptation levels are not very high.

[12] As stated before, Akaike or Schwarz Bayesian criteria are used to determine the lag structure.

[13] By contrast to a simple characterisation of turning points, our probabilities provide the global shape of the cycle phases.

asymmetric shocks are inferred.

Appendix 5 provides the results in terms of desynchronization indicators. Rather than resorting on a set of bivariate analysis with a chosen reference country (usually chosen as Germany), it is better to determine an OCA or to assess the stabilisation costs of a geographic zone in a multivariate way, as pointed out by De Grauwe (1996). This strategy has been followed by several authors like Bayoumi and Eichengreen (1997), Rubin and Thygesen (1997) or Beine, Candelon and Hecq (1998). One obvious reason is that an OCA is a multi-country concept and its determination is made through multivariate bargaining. For instance, France may be willing to support Spain's adhesion because of strongly synchronized business cycles even though the correlation between Italy and Germany is relatively low (this is purely a hypothesis). Therefore, our results are provided in terms of a complete set of cross-country correlations computed for the three desynchronization indicators.

For each indicator, the use of a threshold value may be useful in order to assess the need of stabilization policies. Of course, the choice of a speci¯c value is somewhat arbitrary but some robustness analysis may be easily carried out. Since the indicators are relatively di®erent from each others, it is natural to use di®erent thresholds. As a matter of choice, we use the following values : 0.6 for I_1 and I_3, and 0.5 for I_2 that turns out to be more restrictive. By contrast, since the I_4 indicator has a straightforward interpretation, i.e. the average number of periods where business cycles are synchronized, the choice of a speci¯c threshold is much easier. In this respect, an average period of synchronisation of one year, i.e. 4 periods, seems rather reasonable.

From the ¯rst indicator I_1; one can distinguish three di®erent groups with respect to their correlations with the remaining countries under investigation. The ¯rst one includes countries which are found to be highly correlated either with each others or with other EMU members.[14] These are Germany and Italy (with respectively 6 and 7 values above the threshold) as well as Finland[15] and Portugal. Besides, an intermediate group emerges, including France[16], the UK and the Netherlands, which are found to display similar cycles with the ¯rst group and especially Germany. In this respect, the absence of the Netherlands may be due to the recent diverging performances of this country in terms of unemployment in comparison with its European neighbors. It is indeed well-known that over the recent period, the situation of the labour market in the Netherlands has signi¯cantly improved while the other European members faced worsening conditions. This recent divergence is re°ected in Figure (3a) by the low conditional probability of being in the recessionary regime around 1995. Finally, the analysis of the values of I_1 suggests the existence of a third group including countries with rather idiosyncratic cycles.[17] This latter would include Spain, Norway, Switzerland, and Sweden. As a whole, these results can be considered more or less in line with the ¯ndings of the empirical OCA literature.[18]

As explained above, the introduction of credibility issues through the characterization of cycles phases is expected to give a more optimistic picture of the actual EMU. To a certain extent, this is con¯rmed by

[14] This group is often referred to as the "core" in the OCA literature.

[15] The inclusion of Finland may sound counter-intuitive but this result is also found by Rubin and Thygessen (1997).

[16] The exclusion of France of the core is also well documented by some other OCA studies like Bayoumi and Eichengreen (1997).

[17] Similarly, this group is often referred to as the "periphery".

[18] For recent surveys, see for instance Buti and Sapir (1998). As suggested by a quick overview, it is obvious that most of empirical OCA studies concludes in favor of a core-periphery distinction. Nevertheless, it comes out that there is a deep disagreement accross the main studies on the precise composition of the respective groups.

the inspection of the I_2 indicator. It may be seen that for instance the Netherlands but also Spain are found to have more synchronized cycles with their European partners. In turn, this leads to an extension of the so-called core group. By contrast, the UK is found to be much less synchronized than implied by the first indicator. This suggests that for this country, the peaks and troughs of the business cycles occur at relatively different times compared to the European continental countries, which is in line with previous findings (Artis and Zhang 1997 for instance). The periphery implied by this indicator would contain the UK, Sweden and to a lesser extent Switzerland and Norway.[19]

The use of the indicator I_3 leads to quite a similar picture, with nevertheless a more pessimistic assessment for Spain. Nevertheless, while inferior to our chosen threshold, the values of I_3 are higher than those relative to the countries that display low correlations, i.e. the UK, Switzerland, Sweden and Norway. The computation of this indicator thus confirms the main conclusions of the I_2 indicator, with the Netherlands displaying a synchronised cycle and the UK a more specific one. Thus, the I_2 indicator suggests that our findings are robust to the specific choice of threshold values. In general, it is found that accounting for the turning points of the business cycles (I_2 and I_3 indicators) can lead to different results with respect to more classical indicators represented here by I_1:

The I_4 indicator turns out to shed an interesting light on the synchronisatiuon patterns of the European countries. It may be seen that countries like France, the Netherlands or Spain that appeared to be less synchronised on the basis of the previous indicators display in fact rather long periods of synchronisation. Incidently, it is found that in average, these countries share the same cycle phase with Germany at least for a period longer than five quarters. To a certain extent, the same applies for Switzerland. By contrast, countries like Norway, Sweden or the UK face rather short periods of synchronisation. Combined with the evidence provided by the previous indicators, this means that these countries display idiosyncratic dynamics and could face rather high stabilisation costs if all stabilisation instruments were given up.

Henceforth, an homogeneous picture emerges from this non parametric analysis : a core of countries with synchronized business cycles including Germany, Italy, Finland, Portugal and to a lesser extent the Netherlands; an intermediate group facing higher potential stabilization costs composed of France and Spain that could find useful to rely on domestic fiscal policies and finally, a peripherical group of economies facing more idiosyncratic dynamics with the UK, Norway, Switzerland and Sweden. Interestingly enough, the two first groups are made of countries belonging to the first stage EMU and the last one includes non members. This could suggest that the current EMU could work reasonably well without resorting too often to the provisions of the Stability Pact. Nevertheless, a prospective enlargment of the monetary union should be accompagnied by additional measures aiming at stabilize national economies.

4 Conclusion

In this paper, we have proposed a comparison of business cycles for most European countries. Relying on a Markov Switching VAR approach that characterizes the business cycles phases, we implicitly account for credibility considerations in assessing the asymmetric degree of shocks. In this perspective, we propose

[19] For these two countries, note that 2 out of the 3 positive occurrences are just above the threshold value (0.5).

a set of non parametric indicators based on the conditional probabilities of being in a particular regime implied by the MS VAR. The results suggest that this strategy leads to a more optimistic picture for the new EMU than those proposed by the other empirical analysis that neglect the position of the economy in their business cycle. In particular, this suggests that the present EMU countries will not face too many problems by losing their intra-European nominal exchange rates and that few economies will have to rely on the provisions of the stability pact. By contrast, some so far excluded countries like the UK or Norway could face important stabilization costs if joining the EMU without fiscal autonomy.

This new approach based on the switching regimes VAR models deserves further developments. Among these, the setting up of a new desynchronization indicator (based on a rank analysis for instance) reflecting the lags of the turning points between countries could be useful (although the practical implementation may be cumbersome). A purely inferential procedure testing for the null hypothesis of (de)synchronisation would also be a valuable development of this approach.

Appendix 1 : Unit Root Tests

4.1 Inflation

	ADF(BIC)	ADF(AIC)	ADF(LM)	PP(4)
Por	-6.48^{***}	-0.90	-0.63	-7.23^{***}
Swe	-10.70^{***}	-10.70^{***}	-10.70^{***}	-10.36^{***}
Fin	-8.59^{***}	-8.59^{***}	-2.89^{**}	-6.13^{***}
Nl	-5.34^{***}	-2.74^{*}	-5.34^{***}	-5.53^{***}
Ita	-2.01	-0.69	-2.01	-1.71
Spa	-1.23	-1.23	-1.10	-1.66
Sui	-8.47^{***}	-2.15	-9.27^{***}	-8.71^{***}
Uk	-4.04^{***}	-4.04^{***}	-3.71^{***}	-4.39^{***}
Ger	-3.47^{**}	-2.25	-6.61^{***}	-7.00^{***}
Nw	-2.03	-1.44	-2.03	-2.52
Fra	-2.75^{*}	-2.75^{*}	-1.12	-2.46

4.2 Unemployment[20]

	ADF(BIC)	ADF(AIC)	ADF(LM)	PP(4)
Por	-1.791	-1.791	-1.791	-0.196
Swe	1.394	1.394	1.394	-3.280
Fin	0.882	0.882	0.882	-2.626
Nl	-1.687	-1.687	-1.687	2.416
Ita	-0.768	-0.768	-0.768	0.627
Spa	1.080	1.080	1.080	-0.985
Sui	1.993	1.993	1.993	-2.809
Uk	-0.059	-0.059	-0.059	-2.487
Ger	0.981	0.981	0.981	-1.222
Nw	-4.092^{**}	-4.092^{**}	-4.092^{**}	-7.794^{***}
Fra	2.494	2.494	2.494	-1.722

[20] We use here the logistic transformation, i.e. $\ln(x_t/(1-x_t))$, of the unemployement rate since unit root tests require unbounded variables.

Adf(BIC) refers to the Augmented Dickey-Fuller test statistics (including a constant term) with lag order selected through the Bayesian Information Criterion.

Adf(AIC) refers to the Augmented Dickey-Fuller test statistics (including a constant term) with lag order selected through the Akaike Information Criterion.

Adf(LM) refers to the Augmented Dickey-Fuller test statistics (including a constant term) with lag order selected through the autocorrelation Lagrange Multiplier test.

PP(4) refers to the non parametric test statistics of Phillips-Perron with a Newey-West window equal to 4.

¤¤¤ indicates rejection of the null of a unit root at the 1% signi¯cance level.

¤¤ indicates rejection of the null of a unit root at the 5% signi¯cance level.

¤ indicates rejection of the null of a unit root at the 10% signi¯cance level.

Appendix 2 : Selected Models

Switzerland : Selected Model : m=2, p=1

Equation	Autocorrelation	ARCH	Markov Stability
¢U	36:50	0:85¤¤	11:29
¢p	59:20	32:70	28:85
system	13:15	20:60	25:72

Transition Matrix :

0:9291	0:0913
0:0709	0:9087

Germany : Selected Model : m=1, p=1

Equation	Autocorrelation	ARCH	Markov Stability
¢U	26:57	16:27	2:58¤¤
¢p	0:26¤¤	42:83	0:56¤¤
system	16:53	25:53	0:65¤¤

Transition Matrix :

0:9254	0:2400
0:0746	0:7600

The United Kingdom : Selected Model : m=2, p=4

Equation	Autocorrelation	ARCH	Markov Stability
¢U	64:98	20:65	64:20
¢p	31:62	42:91	53:07
system	18:11	4:21¤¤	64:24

Transition Matrix :

0:7343	0:2882
0:2658	0:7118

Portugal : Selected Model : m=1, p=2

Equation	Autocorrelation	ARCH	Markov Stability
¢U	24:21	74:08	26:68
¢p	60:59	7:04¤	17:20
system	25:93	8:80¤	37:29

Transition Matrix :

0:7573	0:3278
0:2427	0:6722

Spain : Selected Model : m=1, p=1

Equation	Autocorrelation	ARCH	Markov Stability
¢U	13:47	44:50	50:70
¢p	6:90¤	6:50¤	15:11
system	19:01	67:88	19:86

Transition Matrix :

0:8382	0:1366
0:1618	0:8644

France : Selected Model : m=1, p=1

Equation	Autocorrelation	ARCH	Markov Stability
¢U	10:60	83:11	72:25
¢p	84:48	54:31	47:82
system	34:16	13:93	70:40

Transition Matrix :

0:8927	0:1014
0:1073	0:8986

Sweden : Selected Model : m=1, p=1

Equation	Autocorrelation	ARCH	Markov Stability
¢U	7:83¤	43:94	13:02
¢p	4:12¤	21:23	97:53
system	9:42¤	26:07	21:66

Transition Matrix :

0:5943	0:0655
0:4057	0:9345

Norway : Selected Model : m=1, p=1

Equation	Autocorrelation	ARCH	Markov Stability
¢U	57:52	29:92	40:14
¢p	0:50¤¤	0:27¤¤	19:29
system	2:30¤¤	16:07	24:11

Transition Matrix :

0:8088	0:2146
0:1912	0:7854

Finland : Selected Model : m=1, p=4

Equation	Autocorrelation	ARCH	Markov Stability
¢U	14:99	31:14	8:00¤
¢p	10:02	72:08	9:56¤
system	36:83	59:15	8:92¤

Transition Matrix :

0:9008	0:3677
0:0992	0:6323

Italy : Selected Model : m=1, p=4

Equation	Autocorrelation	ARCH	Markov Stability
¢U	3:93¤¤	13:16	53:40
¢p	35:20	71:16	64:45
system	23:03	43:55	70:10

Transition Matrix :

0:8661	0:2967
0:1339	0:7033

The Netherlands : Selected Model : m=2, p=1

Equation	Autocorrelation	ARCH	Markov Stability
¢U	0:28¤¤	0:74¤¤	8:03¤
¢p	8:34¤	11:86	63:17
system	5:66¤	7:60¤	70:00

Transition Matrix :

0:9302	0:191
0:070	0:809

Appendix 3 : Smoothed probabilities

Appendix 4 : Business Cycles Turning Points Datation

	Germany	France	The UK	Italy
Peak	80M2	76M12	79M4	77M1
Trough	82M10	77M10	81M2	77M12
Peak	86M5	79M9	83M12	80M3
Trough	86M12	81M1	84M8	83M3
Peak	91M4	82M3	90M3	89M12
Trough		82M10	92M4	
Peak		84M2		
Trough		85M2		
Peak		92M1		

Datations are extracted from ¯gures 1 to 7 in Artis, Kontolemis and Osborn (1995)

Appendix 5 : Synchronization indicators

	France	Germany	Italy	Spain	Finland	Norway
France	-	0.68071	0.61222	0.59019	0.54158	0.48597
Germany	0.68071	-	0.76163	0.56182	0.70643	0.49720
Italy	0.61222	0.76163	-	0.57104	0.73125	0.53212
Spain	0.59019	0.56182	0.57104	-	0.66783	0.53750
Finland	0.54158	0.70643	0.73125	0.66783	-	0.57343
Norway	0.48597	0.49720	0.53212	0.53750	0.57343	-
Portugal	0.70430	0.72319	0.69765	0.58873	0.66793	0.55575
The Netherlands	0.45452	0.61406	0.61681	0.55527	0.69480	0.58848
The United Kingdom	0.53369	0.67181	0.60728	0.54513	0.63023	0.42670
Switzerland	0.53154	0.52092	0.56806	0.54250	0.57325	0.59391
Sweden	0.48677	0.41425	0.36870	0.55125	0.37599	0.44962

	Portugal	The NL	The U K	Switzerland	Sweden
France	0.70430	0.45452	0.53369	0.53154	0.48677
Germany	0.72319	0.61406	0.67181	0.52092	0.41425
Italy	0.69765	0.61681	0.60728	0.56806	0.36870
Spain	0.58873	0.55527	0.54513	0.54250	0.55125
Finland	0.66793	0.69480	0.63023	0.57325	0.37599
Norway	0.55575	0.58848	0.42670	0.59391	0.44962
Portugal	-	0.56660	0.59960	0.48231	0.39581
The Netherlands	0.56660	-	0.53801	0.59003	0.33305
The United Kingdom	0.59960	0.53801	-	0.50362	0.56465
Switzerland	0.48231	0.59003	0.50362	-	0.55700
Sweden	0.39581	0.33305	0.56465	0.55700	-

Figure 1: Desynchronization Indicator I1

	France	Germany	Italy	Spain	Finland	Norway
France	-	0.59420	0.50725	0.47826	0.39130	0.39130
Germany	0.59420	-	0.65217	0.53623	0.63768	0.40580
Italy	0.50725	0.65217	-	0.49275	0.68116	0.42029
Spain	0.47826	0.53623	0.49275	-	0.60870	0.50725
Finland	0.39130	0.63768	0.68116	0.60870	-	0.49275
Norway	0.39130	0.40580	0.42029	0.50725	0.49275	-
Portugal	0.59420	0.66667	0.65217	0.52174	0.62319	0.47826
The Netherlands	0.36232	0.57971	0.56522	0.53623	0.65217	0.56522
The United Kingdom	0.37681	0.55072	0.40580	0.37681	0.44928	0.24638
Switzerland	0.37681	0.42029	0.43478	0.49275	0.50725	0.50725
Sweden	0.40580	0.37681	0.26087	0.52174	0.31884	0.37681

	Portugal	The NL	The U K	Switzerland	Sweden
Germany	0.66667	0.57971	0.55072	0.42029	0.37681
Italy	0.65217	0.56522	0.40580	0.43478	0.26087
Spain	0.52174	0.53623	0.37681	0.49275	0.52174
Finland	0.62319	0.65217	0.44928	0.50725	0.31884
Norway	0.47826	0.56522	0.24638	0.50725	0.37681
Portugal	-	0.53623	0.44928	0.39130	0.33333
The Netherlands	0.53623	-	0.40580	0.52174	0.30435
The United Kingdom	0.44928	0.40580	-	0.34783	0.46377
Switzerland	0.39130	0.52174	0.34783	-	0.52174
Sweden	0.33333	0.30435	0.46377	0.52174	-

Figure 2: Desynchronization Indicator I2

	France	Germany	Italy	Spain	Finland	Norway
France	-	0.66667	0.60870	0.55797	0.49275	0.48551
Germany	0.66667	-	0.73913	0.55797	0.69565	0.45652
Italy	0.60870	0.73913	-	0.57246	0.75362	0.51449
Spain	0.55797	0.55797	0.57246	-	0.65942	0.53623
Finland	0.49275	0.69565	0.75362	0.65942	-	0.55797
Norway	0.48551	0.45652	0.51449	0.53623	0.55797	-
Portugal	0.68841	0.71739	0.71739	0.56522	0.67391	0.53623
The Netherlands	0.43478	0.60870	0.63768	0.55797	0.69565	0.60145
The United Kingdom	0.50725	0.68116	0.57971	0.51449	0.59420	0.38406
Switzerland	0.48551	0.48551	0.54348	0.55072	0.57246	0.57971
Sweden	0.48551	0.41304	0.34058	0.55072	0.36957	0.42029

	Portugal	The NL	The U K	Switzerland	Sweden
France	0.68841	0.43478	0.50725	0.48551	0.48551
Germany	0.71739	0.60870	0.68116	0.48551	0.41304
Italy	0.71739	0.63768	0.57971	0.54348	0.34058
Spain	0.56522	0.55797	0.51449	0.55072	0.55072
Finland	0.67391	0.69565	0.59420	0.57246	0.36957
Norway	0.53623	0.60145	0.38406	0.57971	0.42029
Portugal	-	0.57246	0.58696	0.46377	0.37681
The Netherlands	0.57246	-	0.52174	0.57246	0.31159
The United Kingdom	0.58696	0.52174	-	0.50000	0.57246
Switzerland	0.46377	0.57246	0.50000	-	0.57971
Sweden	0.37681	0.31159	0.57246	0.57971	-

Figure 3: Desynchronization Indicator I3

	France	Germany	Italy	Spain	Finland	Norway
France	-	5.85714	3.88889	4.12500	4.50000	3.37500
Germany	5.85714	-	6.42857	5.28571	7.33333	3.50000
Italy	3.88889	6.42857	-	4.85714	5.87500	3.62500
Spain	4.12500	5.28571	4.85714	-	4.20000	3.50000
Finland	4.50000	7.33333	5.87500	4.20000	-	3.40000
Norway	3.37500	3.50000	3.62500	3.50000	3.40000	-
Portugal	5.87514	5.75000	5.62500	5.14286	5.37500	3.30000
The Netherlands	5.00000	6.66667	6.50000	4.11111	7.50000	3.90000
The United Kingdom	2.36364	3.80000	3.11111	3.71429	3.10000	1.70000
Switzerland	4.33333	3.62500	4.28571	4.25000	5.83333	3.50000
Sweden	3.11111	3.25000	2.25000	3.27273	2.75000	2.60000

	Portugal	The NL	The U K	Switzerland	Sweden
France	5.85714	5.00000	2.36364	4.33333	3.11111
Germany	5.75000	6.66667	3.80000	3.62500	3.25000
Italy	5.62500	6.50000	3.11111	4.28571	2.25000
Spain	5.14286	4.11111	3.71429	4.25000	3.27273
Finland	5.37500	7.50000	3.10000	5.83333	2.75000
Norway	3.30000	3.90000	1.70000	3.50000	2.60000
Portugal	-	9.25000	3.44444	3.85714	3.28571
The Netherlands	9.25000	-	3.11111	6.00000	3.50000
The United Kingdom	3.44444	3.11111	-	2.40000	2.90909
Switzerland	3.85714	6.00000	2.40000	-	4.50000
Sweden	3.28527	3.50000	2.90909	4.50000	-

Figure 4: Desynchronization Indicator I4

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